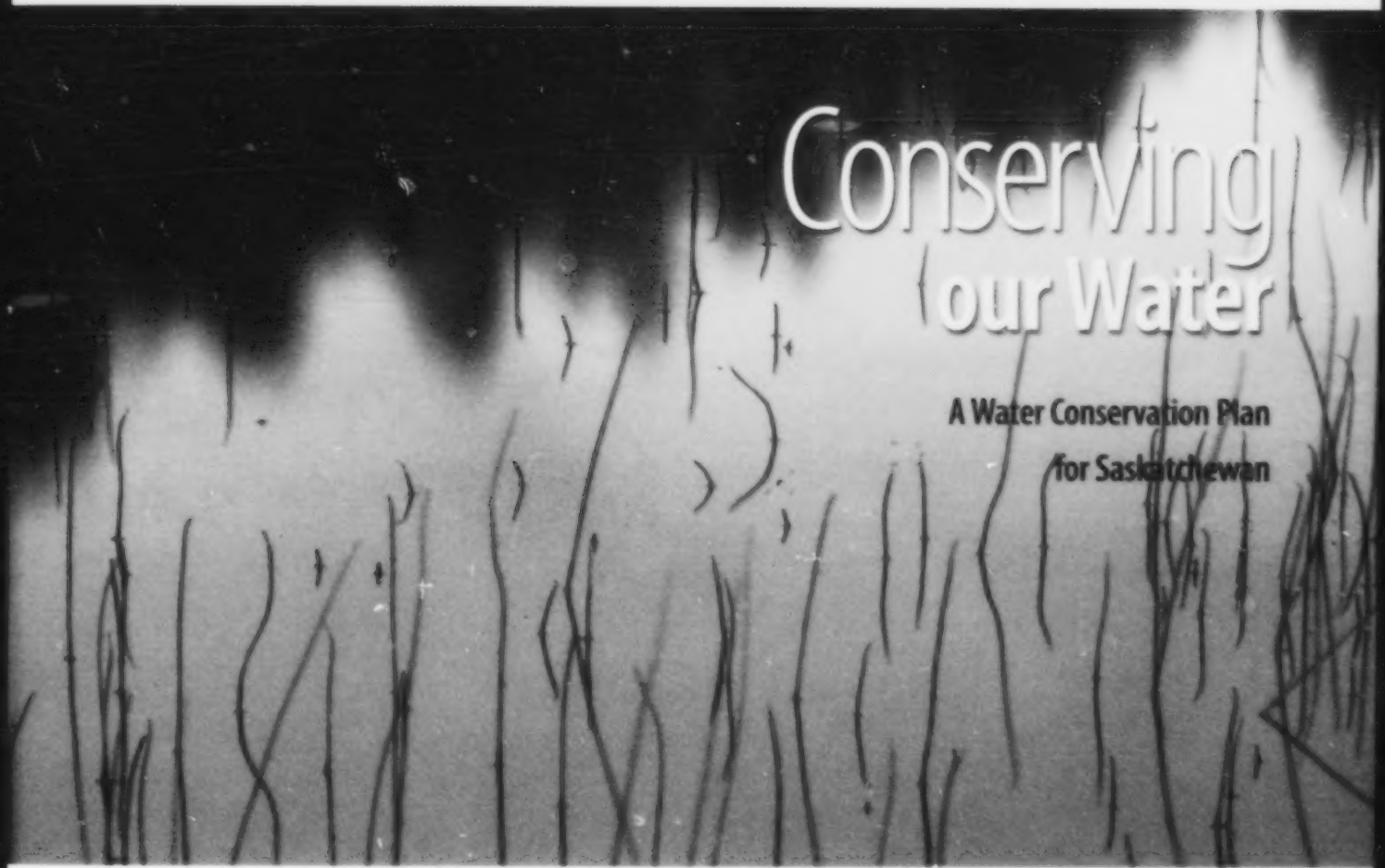
Saskatchewan Watershed Authority

Saskatchewan Centennial 2005



Conserving our Water

A Water Conservation Plan for Saskatchewan

A Discussion Guide for Public Consultation

Message from the Ministers

Virtually all the world's religions accord significant spiritual or ritual importance to water. This is scarcely surprising. Water is essential to all life on earth.

It is also unsurprising that water has become a major strategic commodity in the new millennium. According to the Honourable Donald J. Johnston, Secretary-General of the Organization for Economic Co-operation and Development, "while in the world of nature, water is the universal solvent, in the world of politics, water is more likely to generate conundrums than solutions. Indeed, some are saying that water will be the challenge of the 21st century in the way oil has been since the 20th."

Saskatchewan is blessed with an abundant supply of fresh water, almost seven percent of the fresh water in Canada or nearly 1.5 percent of all the freshwater in the world. As responsible citizens of Saskatchewan, citizens of Canada, citizens of the world we have a profound moral responsibility to ensure that we are effective stewards of this precious resource.

We must not underestimate the water challenges we face. Water availability in our province ranges from very large available water supplies in much of Northern Saskatchewan to some western watersheds where there are major supply constraints. Historically, only the Saskatchewan River system and the boreal shield are considered to have relatively abundant supplies of good quality fresh water. In recent years flows in both have been reduced by drought in the mountains and Northern Saskatchewan respectively.

We use that water for human consumption, but also to support agriculture, industry, and recreation. Are we using our water effectively to maximize our own social and economic potential? At the same time, are we managing and protecting our water in a way that is sustainable, that preserves and protects the resource for the use, the enjoyment and the very survival of future generations?

To offer just one example, a large percentage of Saskatchewan residents rely on the South Saskatchewan River system for their water needs. Over the past century flows in the Saskatchewan River system have declined due to increasing withdrawals and to changes in the environment, while our population and our demand for water continue to rise. Climate change will bring further changes to the prairies with inevitable impacts on water supply and water demand. Should the province consider specific water conservation measures in heavily utilized river basins such as the South Saskatchewan River basin?

In the October 2002 *Safe Drinking Water Strategy*, our government made a commitment to water conservation. This consultation document is the first major step towards a water conservation plan for Saskatchewan. In this document, citizens will find a summary of water conservation issues, as well as a series of questions. These questions are not intended to limit the scope of discussions, but to spark a deeper reflection.

Over the coming months, there will be opportunities for groups and for individual citizens to make presentations to officials. There will also be opportunities for individuals to make written submissions either by mail or online.

We hope that this public consultation will allow for a full, comprehensive and rigorous discussion of the issues, leading eventually to a provincial consensus on the way ahead for water conservation in Saskatchewan.

As our province moves into its second century, we owe it to the next generation of Saskatchewan citizens to manage our water resources wisely so they can sustain us and our ecosystems through the next century. Your participation in this consultation process will help us all to fulfill that obligation.

The Honourable David Forbes

The Honourable Peter Prebble

Why Conserve Water

The decision to develop a water conservation plan flows from Saskatchewan's *Safe Drinking Water Strategy* and the commitment to a green and prosperous economy. A secure and high quality water supply is also an essential component of our health strategy. Water conservation makes important contributions to both a prosperous economy and a healthy environment. A secure, well managed water supply is essential to economic expansion while ensuring an adequate supply remains for environmental considerations. One of the objectives of the *Safe Drinking Water Strategy* is reduced consumption of water, reflecting a broad commitment to both water quality and quantity issues, and a commitment to addressing issues around supply and demand management.

Traditional water management has focused on increasing supplies. However, in many areas of the world water demand is reaching or exceeding the sustainable supply, prompting concerns of a global water crisis and drawing attention to conservation as an effective means of improving water availability.

Water conservation seeks to reduce water use through the promotion of more efficient water use and the elimination of waste. Water conservation does not necessarily mean total water withdrawals will decline. Economic growth creates new demands for water. A successful water conservation program will mean that water withdrawals will grow more slowly than they otherwise would have. For example, there is potential in Saskatchewan for increased irrigation. If the number of irrigated acres were to increase significantly, total water use would probably increase as well, but not as much as it would have without conservation measures. Efficiency or productivity per unit of water would improve.

Canadians are the second highest water users in the world. While the high water use reflects aspects of our economy, it also shows that there is significant potential to conserve water. Canadians, at least in urban centres, use much more water for domestic purposes than most developed countries. The average urban Canadian uses 343 litres per capita per day residentially. In Saskatchewan, average residential daily per capita use was 293 litres per day in 2003. When considering all community uses (commercial, recreational and industrial systems found within a municipality) the average use for 2003 was 375 litres per capita per day.

One advantage of water conservation is that it can increase economic efficiency and thus reduce costs. Pumping water requires significant amounts of energy and can be a major cost for irrigators and for municipalities. Wise use of water will save energy, thus reducing costs for water users. Similarly, reducing water use reduces the need for new infrastructure and other related costs. If a community can grow within its existing water supply, it can avoid expensive expansions to water treatment and other water facilities. This produces direct savings to users.

A second benefit is that water conservation makes water available for other uses, allowing new economic opportunities. While the importance of this is greatest in areas where water is fully allocated, efficient use of all resources is an essential component of a green and prosperous economy. In addition, as global warming places pressure on water supplies and further development adds water demand, the value of available water supplies will increase.

Within the context of overall water management and conservation, emphasis on long-term sustainability benefits our environment, our health and our economy. From an environmental and health perspective, water conservation policies ensure that quantity and quality requirements are sustained relative to supply and demand in both short and long-term planning. From an economic perspective, proactive and progressive water conservation policies offer significant potential in terms of enhancing and improving Saskatchewan's advantages in terms of growth and expansion. Whether it is at the industrial input level or as a factor affecting our quality of life, water quantity and quality will continue to increase in importance and influence the location of socioeconomic development and population concentrations.

Reducing water use through conservation would enhance the capacity for hydroelectric generation on the Saskatchewan River system.

Water in this system passes through up to three hydrogeneration stations, providing relatively inexpensive and clean electricity for the province. As well, four other hydro generation plants are in operation in the North.

The environment also benefits from water conservation. Each river and lake is an ecosystem. As water is removed from aquatic systems, they become stressed. The greater the percentage of water removed, the less that remains for natural processes such as instream flows that support fish and other life. Thus, water conservation helps to maintain healthy ecosystems, protect biodiversity and maintain an attractive environment and contribute to our health and quality of life. Water conservation will help Saskatchewan reduce its greenhouse gas emissions, both by saving water for hydro-electric generation and by reducing the energy required to pump water.

In Saskatchewan, water availability ranges from very large available water supplies in much of northern Saskatchewan, to some southwestern watersheds where no new surface water allocations are being made due to supply constraints. Water supplies also vary significantly depending on where one is located within a watershed. In areas of higher water demand, compared to supply, conservation measures would produce a greater return than in areas of relative water abundance. Nonetheless, water conservation in any area can yield benefits to the ecosystem, to quality of life and to the economy.

The Saskatchewan Watershed Authority has initiated a watershed planning process which involves citizens in addressing source water protection. Each committee will have the opportunity to address issues including demand and supply management.

Is Water Conservation a New Idea?

Many Saskatchewan individuals, businesses and municipalities are already working to conserve water. SaskWater has produced educational material on water conservation since the 1980's and various federal and provincial programs have supported steps to conserve water. The City of Regina began its water conservation program in 1985. Both per capita use and peak day water consumption are declining. Saskatoon and many other municipalities also promote water conservation measures. A recent survey showed that a majority of residents of the Upper Qu'Appelle River Watershed indicate they take water conservation measures, mostly low cost measures such as restricting lawn watering and washing full loads of laundry.

The concept of conserving water is not new. In many areas of rural Saskatchewan where water is limited, it has always been and continues to be a fact of life. Our experience with periodic droughts has also encouraged many communities to look at water conservation measures. Nonetheless, our high daily water use indicates that many steps can still be taken to conserve water.

Water Conservation – A Global Trend

Many provincial and state governments have implemented water conservation plans in North America. Internationally, the European Community and many Asian countries have developed programs similar to those used in North America. The majority of these jurisdictions tend to implement water conservation programs targeted to municipal users. Jurisdictions facing the most severe shortages have also targeted industrial and agricultural uses.

Many provincial and state governments have implemented water conservation plans in North America.

The water conservation plans of various national and international governments have common themes and characteristics between them. Many of the goals are the same in that they address the importance of water conservation in terms of improved quality and quantity, protecting the environment and addressing limits to growth.

Many of these plans focus on education and extension activities, development of best management practices, promotion of low consumption devices and circulation of informational material. A few jurisdictions have established specific reduction targets and have implemented both regulatory controls and incentives for water conservation.

Jurisdiction	Education / Extension	Regulatory	Incentives
Alberta	X		
Manitoba	X		
British Columbia	X		
Ontario	X		
California	X	X	X
Texas	X	X	X
North Dakota	X		
United States (federal)	X		
China	X	X	
England	X		X

Canadian Council of Ministers of the Environment

The Canadian Council of Ministers of the Environment is the major intergovernmental forum in Canada for discussion and joint action on environmental issues of national concern. The 14-member governments work as partners in developing nationally consistent environmental standards and practices.

The Canadian Council of Ministers of the Environment has initiated national work to promote water conservation. This work is expected to continue over a three-year period. Initially, the Council has initiated an analysis of water conservation measures and an evaluation of economic instruments. This analysis will include:

- a summary of conservation practices in Canadian jurisdictions, and analysis of their effectiveness and existing and potential implementation barriers
- a summary of conservation practices in other countries and analysis of their effectiveness and implementation barriers and a comparison to practices implemented in Canadian jurisdictions
- investigation of opportunities to implement promising practices more broadly in Canadian jurisdictions
- analysis of economic instruments for water conservation such as pricing, retrofit programs, tax and financial incentives, penalties and pollution charges including:
  - surveys of Canadian jurisdictions on the range of economic instruments in use or available along with the rationale used for selecting each instrument
  - developing an understanding of the economic value of water and the best techniques for valuing water by use sector
  - evaluating the merits and barriers of economic instruments
  - an overview of the successes and barriers to implementation of economic instruments and opportunities to increase their use
  - examination of water conservation performance indicators to benchmark performance

Preliminary evaluations regarding the increasing importance of water are documented in the recent Environment Canada study entitled *Threats to Water Availability in Canada*. According to this study, "among the emerging issues identified are the growing requirements of high-technology new economy industries for substantial amounts of high-quality water, possibly from already stressed municipal sources." Identified industries included knowledge-based manufacturing activities such as computers and electronics, biotechnology and pharmaceuticals, and various service industries. In terms of the specific industry sectors such as agri-food and energy, which are priorities for this province, water management policies that incorporate conservation activities and practices will likely have a significant impact upon where future investment and employment opportunities are expanded or created.

Consultation and Planning Process

We all use water. We all depend on water. Therefore, water conservation can only be achieved by all sectors of society working together.

Saskatchewan's *Safe Drinking Water Strategy* provides the overall direction guiding the work of all the provincial agencies involved with water to maintain a clean, safe and secure water supply. One of the objectives identified in the *Safe Drinking Water Strategy* is water conservation. Saskatchewan's Water Conservation Plan will set out the actions needed to achieve the water conservation objective. Once developed, the Water Conservation Plan will be implemented as an integral part of the *Safe Drinking Water Strategy*. Because this strategy is reported annually, this will ensure that water conservation initiatives are also reported once a year.

This document is designed to support consultation with groups and individuals interested in water use. Various ideas for water conservation are identified. We expect, through the consultations, to identify additional approaches to water conservation and to modify possible approaches identified here. We also expect to obtain advice as to the most appropriate roles for different levels of government, individuals and businesses in achieving water conservation goals. Based on those consultations, the Saskatchewan Watershed Authority will develop a final Water Conservation Plan for consideration by Cabinet in 2005.

Interested groups and individuals can take part in this consultation process in a number of ways, including:

- responding to the questions found at the back of this document and mailing them to the address indicated
- going online to www.swa.ca/waterconservation and responding to the questions using the online form
- attending one of the five public meetings and submitting a formal or informal brief
    - Regina – Monday, Jan. 31 - 7:00 p.m. Travelodge, 4177 Albert Street
    - Swift Current – Thursday, Feb. 3 - 9:30 a.m. Days Inn, Highway #1 East
    - Saskatoon – Monday, Feb. 7 - 7:00 p.m. Travelodge, 106 Circle Drive West
    - Prince Albert – Tuesday, Feb. 8 - 9:30 a.m. Travelodge, 3551 - 2nd Avenue West.
    - LaRonge – Thursday, Feb. 10 - 1:00 p.m. LaRonge Motor Hotel, 1120 LaRonge Ave.

Water Use Trends, Allocations and Availability

Supply

Saskatchewan's surface and ground water resources are highly variable. Geography, climate, the amount of annual runoff and season all influence the supply of surface water. Although groundwater is present in most parts of southern Saskatchewan, the extent of aquifers, their depths, yields and quality vary considerably. As a result, site specific ground water investigations are required before new groundwater projects can be developed.

Historically, the Saskatchewan River system and the Boreal Shield are the only regions in Saskatchewan considered to have relatively abundant supplies of good quality freshwater. The eastern slopes of the Rocky Mountains in Alberta contribute about 90 percent of the flow in the Saskatchewan River system, whereas over 95 percent of the flow in the Churchill River comes from precipitation occurring in the province.

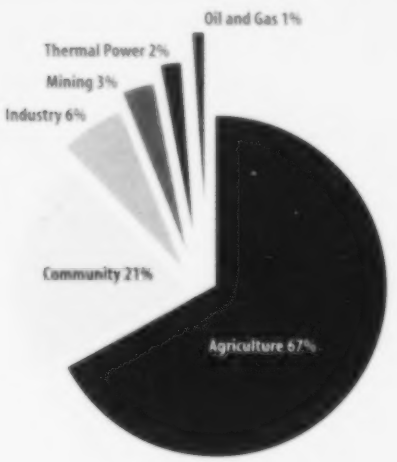
Currently, flows in the Saskatchewan River system and the Boreal Shield are noticeably affected by droughts in the mountains and in northern Saskatchewan respectively. Interprovincial flows are managed through agreement between the three Prairie provinces and the federal government. The Prairie Provinces Water Board is responsible to ensure that transboundary water flows, as in the Saskatchewan River system, are fairly shared with each jurisdiction. Similar arrangements under *The Boundary Waters Treaty* exist on streams flowing into the United States. In general these agreements require that we pass one half of the natural flow we receive on to our neighbour.

Extended droughts and climate change will also directly affect shallow aquifers. Deeper aquifers with generally poorer water quality will be influenced over a longer period of time.

Water Use

Irrigation is by far the single largest consumptive use of water in the province with community use second. These two sectors consume almost 90 percent of the freshwater used in the province *(Figure 1)*. Accordingly, conservation efforts in the agricultural and community sectors will have the most influence on the overall success of water conservation efforts in the province.

Figure 1 – Freshwater Withdrawals in Saskatchewan by Sector



Water Use Trends, Allocations and Availability

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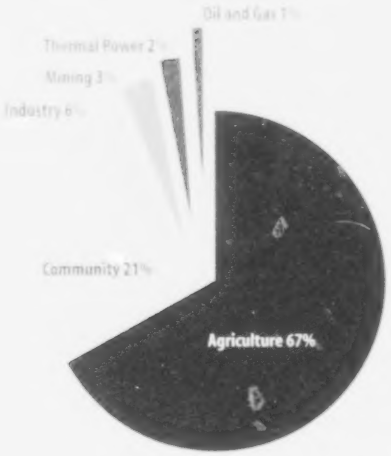

The location of water use is determined primarily by settlement patterns and the position of primary resources including soils suitable for irrigation. Almost 70 percent of water consumed in the province originates in the South Saskatchewan, North Saskatchewan and Qu'Appelle river basins (*Table 1*). Water from Lake Diefenbaker supplies about 90 percent of the flow in the Qu'Appelle River in low flow years. Buffalo Pound Lake, along the Upper Qu'Appelle, supplies water to the cities of Moose Jaw and Regina.

Figure 2 – Saskatchewan Watershed Major Hydrological Basins

Table 1 – Percentage of Total Freshwater Withdrawals by Major Basin (Surface and Ground Water)

River Basin	Percent
Souris	4.2
Missouri	10.1
Cypress Hills	3.7
Old Wives	0.7
Qu'Appelle	13.6
South Saskatchewan	42.3
North Saskatchewan	13.1
Saskatchewan	1.5
Assiniboine	1.4
Lake Winnipegosis	0.4
Churchill / Athabasca	3.0

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Allocation and Availability

Subject to various exemptions such as domestic and municipal water and wastewater plants, the Saskatchewan Watershed Authority authorizes the construction of water works and allocations of water. This is an essential regulatory process to ensure sustainability of water supplies.

The amount of water licensed by a project, usually called allocation, includes the amount used and associated losses such as evaporation from a reservoir. While losses may be significant (for example, on average the evaporation from Lake Diefenbaker accounts for about five percent of reservoir inflow), they are usually considered more or less fixed and irreversible. On the other hand, allocations are directly associated with the intended use or uses of the water.

In most cases, allocations approximate the amount used. Exceptions are where the amount of water to be used is expected to increase over the life of the project. For example, the amount of water allocated to the Buffalo Pound Water Administration Board for treatment and delivery to the cities of Moose Jaw and Regina and various surrounding communities is about 3.4 times the current use. This large allocation ensures the cities available supplies for future growth.

Table 2 provides an indication of the supply and intensity of use of water in the major drainage basins of the province. In general, supplies are good, and are very large in more northern basins, compared to water use. However, flows in our major rivers can fluctuate significantly between wet and dry years. In years of less than median flow, intensity of use is higher. In addition, these figures represent the overall situation for a watershed.

Table 2 – Surface Water Availability in Saskatchewan by Major Basin (million cubic metres)

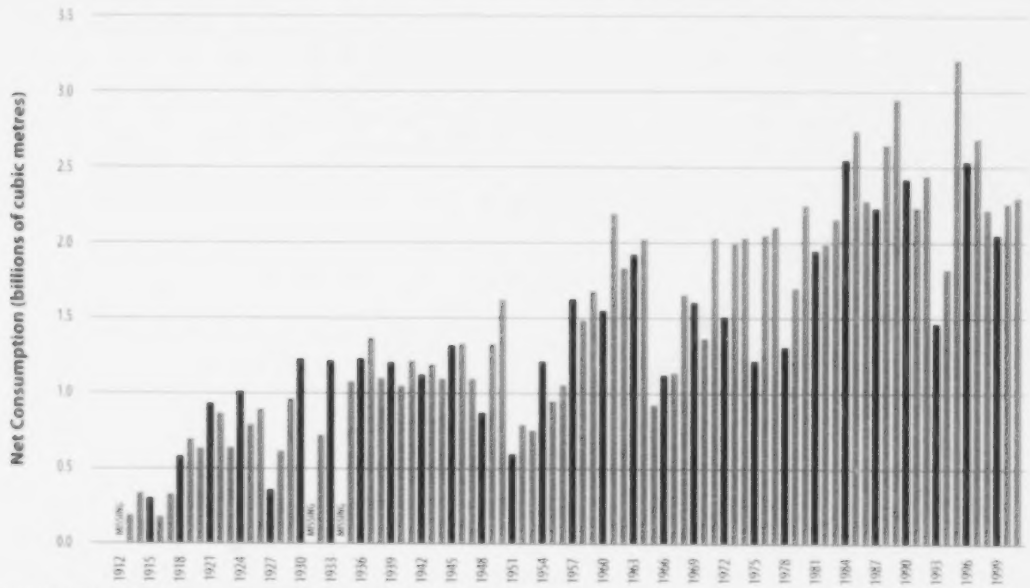
River Basin	Allocation[1]	Losses[2]	Supply[3]	Intensity Use[4]
Souris	32.5	55.9	182	0.18
Missouri	74.0	25.3	131	0.56
Cypress Hills	27.1	6.0	n / a	n / a
Old Wives	73.7	41.5	n / a	n / a
Qu'Appelle	*56.6	145.0	123	0.46
South Saskatchewan	1,187.9	72.1	5,340	0.22
North Saskatchewan	142.2	86.1	7,390	0.02
Saskatchewan	23.8	388.5	15,100	< 0.01
Assiniboine	3.5	23.4	144	0.02
Lake Winnipegosis	3.4	33.5	825	< 0.01
Churchill	13.3	157.2	21,300	< 0.01
Athabasca	4.1	0.3	20,000	< 0.01

1. Domestic water use not officially allocated. Diversion (licensed amount) = Allocation + Losses
2. Primarily reservoir losses
3. Estimated Median Annual Flow
4. Ratio of allocation / supply

* water diverted from the South Saskatchewan River makes up the difference between the water losses and supply in the Qu'Appelle

The Saskatchewan River basins (North and South) have an added pressure not directly related to allocation within the province. Decreases to the available supply have resulted from an increased demand in Alberta. Alberta is required to deliver at least 50 percent of the natural flow (recorded flow at the border must be at least 50 percent of the natural flow). The South Saskatchewan River is under the most stress in terms of upstream water uses and the water delivered. Alberta has always provided greater than the minimum 50 percent of the natural flows to Saskatchewan. Several graphs illustrate the water allocations in Alberta and the natural and recorded flows. The trend has been that water allocations have increased, and the difference between natural flow and recorded flow has increased, especially in the dry years.

Figure 5 – Estimated Annual Net Consumption in the South Saskatchewan River upstream of Medicine Hat, 1912-2001



(1) – Seneka, Michael, **Trends in Historical Annual Flows for Major Rivers in Alberta,** Alberta Environment, February 2004.

Figure 6–Annual Recorded and Natural Volumes, South Saskatchewan River at the Alberta/Saskatchewan Border

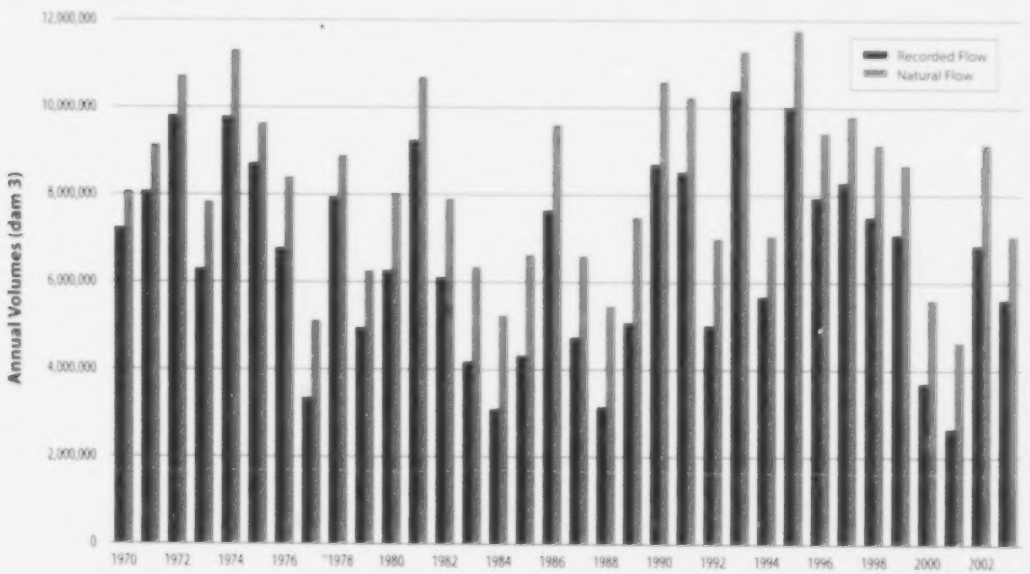


Figure 7 – Recorded Flow as a Percentage of Natural Flow of the South Saskatchewan River at Alberta/Sask Border

Climate Change

Climate change has become a major environmental issue. Climate change evaluations and responses involve the major environmental components of water, air and land. Leading international organizations have identified water as the key resource that will have profound implications for future living standards affecting every corner of the planet. According to the United Nations, as much as two-thirds of the world's population could face water scarcity problems over the long term.

In response to climate changes, major policy evaluations are being undertaken in Canada regarding international, national, regional and provincial projections and forecasts. Common themes and potential impacts have been identified regarding water sustainability and conservation for Canada, the prairie provinces and specifically for Saskatchewan.

In addition to the combination of factors involving industrialization and population growth, climate changes will place increased pressures upon water supplies and the accompanying supporting ecosystems in Canada.

Climate change forecasts and projections take a long-term view. The Saskatchewan Watershed Authority is participating in two major studies of the Saskatchewan River Basin to assess water availability in the future. It is anticipated that even with an increase in the average annual precipitation predicted for the Prairie provinces, increased evaporation rates across the prairies will ultimately mean an overall decrease in available surface water supplies.

Climate change has the potential for further impacting on the availability of water in the Saskatchewan River basins. This stress, coupled with the increasing demand in Alberta, will have impacts on how the province manages water in these basins.

Principles

The following principles will guide development of Saskatchewan's Water Conservation Plan.

Principle 1: Water sustains life

- Water is essential for the health and well-being of all life, our society and the ecosystems on which we depend.
- The right to water is a fundamental requirement to live a dignified and healthy life.
- Water is an integral aspect of the environmental cycle.
- Water has both social and economic value.

Principle 2: Water is a renewable yet finite resource

- Water use must be sustainable.
- Water use is part of the hydrological cycle with renewable and reusable characteristics.
- Water availability is limited by social, economic and environmental factors.
- Efficient water use offers cost / benefit advantages.
- Water quantity and quality are integral aspects of effective water management.

Principle 3: Water is a public trust, a shared legacy and a collective responsibility

- Saskatchewan's water belongs to all citizens and is managed for the interest and wellbeing of all people of the province.
- All citizens have a right to access water for their basic needs.
- Society has a collective responsibility to protect water supplies.
- Respect for the needs of others for water requires equity both across society and across generations.
- Water, and the obligation to conserve it, is shared with our neighbours.
- Recognize the primacy of fresh water to human life and ecosystem health by ensuring both equitable access for all members of society and adequate flows for the environment.

Principle 4: Water Efficiency / Productivity

- Water is important for economic development in all sectors and all regions.
- Conservation implies wise use or efficient use of water.
- Conservation implies planning for periods of low supplies and meeting ecological as well as human needs.
- Conservation implies increasing value from water used.

Principle 5: Fair value for water

- Water is not free, but has costs attached both in terms of being a resource and the structures utilized in the sourcing, movement and application of water (uses).

Principle 6: Comprehensive, long-term and integrated approach

- Water conservation is part of overall water management.
- Water demand, not just supply, is managed.
- Investing in institutional changes will establish demand management as a central feature of water provision and as an ongoing adaptive process.
- Evaluation, reporting and adjustment are components of a water conservation program.

Principle 7: Citizen involvement and participatory decision-making

- Citizens have rights to meaningful participation in water management.

Principle 8: Leadership

- Public institutions lead by example, incorporating best practices and cutting edge environmentally based technologies and processes.
- Build capacity to effectively advise on existing and emerging domestic and international water management issues.
- Expand scientific, ecological and socioeconomic research through enhanced data collection, technological development and pilot projects.

Agriculture

Current use

The major water uses in agriculture are for irrigation and livestock. In use on about 137,000 hectares of land, irrigation is by far the single largest water user in the province. This compares with 630,000 and 27,000 hectares for Alberta and Manitoba respectively. Irrigation contributes significantly to agricultural productivity. For example, approximately 30 percent of the beef production in the southwest depends on irrigation.

Water withdrawals are metered on some irrigation projects, but not on others. The province maintains data on water allocations, irrigated areas and type of irrigation which allow estimates of water diversions.

About 550 million cubic metres of water or two-thirds of total water withdrawals in the province are diverted for irrigation. Actual crop use is below this amount mainly due to conveyance losses. The largest amount of water for irrigation is drawn from Lake Diefenbaker. Other watersheds provide irrigation water as well. In terms of percentage of total water supply, irrigation is especially significant in some of the streams in the Missouri River drainage basin.

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For the most part, in Saskatchewan and Alberta, irrigation is intensive or full delivery, meaning the full water requirement of the crop can be supplied by irrigation. The figure used by the Saskatchewan Watershed Authority to define intensive water use is a minimum of 3.0 cubic decametres per hectare (12 inches) that can be applied throughout the frost-free season.

Most irrigation in Saskatchewan is by sprinkler (75,000 hectares – 55 percent), usually central pivot systems. However, there are significant areas using flood (23,000 hectares – 17 percent) and backflood (38,000 hectares – 27 percent) irrigation technologies. In Manitoba, nearly 100 percent of irrigation water is applied by sprinkler. By comparison, about 75 percent of irrigation in Alberta is sprinkler with about 20 percent using flood irrigation.

Open channel flows are used to deliver water for irrigation and other needs in several areas of the province. Open channel delivery systems lose water during the flooding stage, making for an inefficient system when compared to closed pipe systems. However, pipelines have higher construction and operating costs.

Water consumption by large livestock operations is also a significant water use. Data from the Prairie Swine Center indicates that a 2,500 sow farrow to finish barn would use about 120,000 litres per day. For feedlots for cattle, the usage the industry assumes is 45 litres/head/day (10 gallons/head/day). Currently, there are approximately 200,000 head in feedlots and demand is between 1.5 and 2 billion litres. Cow calf operations also require significant amounts of water, although this water demand is usually more dispersed. Finding an adequate water supply can be an issue in siting an intensive livestock operation.

Demand

Demand for irrigation is expected to grow both because it significantly increases output per hectare of land and because it provides more stability in agricultural production, thus more economic stability for farmers and farm communities. Global warming, which current models indicate will increase the frequency and severity of drought, will probably add to the pressure to use irrigation to ensure productivity. Several million acres of farm land are suitable for irrigation. The land available to be irrigated almost certainly exceeds the water supply potentially available for irrigation.

There are large areas of land in the Lake Diefenbaker area that are not currently under irrigation but have suitable soil types which could receive water. Some of these lands are close enough to existing supply systems that they can be added with little additional cost, while significant infrastructure investments would be required for others.

Saskatchewan is targeting significant growth in livestock production, especially in cattle and beef. This growth will significantly increase water use.

Conservation Potential

Several areas have been identified as having potential for water conservation. Saskatchewan welcomes comment on these possible actions and suggestions of other potential actions which will conserve water.

Conversion from flood irrigation to sprinkler irrigation technology and the change from open channel to closed pipe delivery systems

- Alfalfa production per unit of water can be increased from 400 to 600 percent.
- This could be especially valuable in some southwestern drainages where all water is allocated and conversion to a more efficient technology could allow allocations to new uses such as increased areas under irrigation.
- Cost of converting to sprinkler irrigation inhibits this change.
- Costs of change make it effective only where the supply is secure to allow irrigation most years.

Conversion from high pressure to low pressure sprinkler systems

- This produces a modest increase in water efficiency.
- Producers are converting to low pressure systems when equipment needs to be replaced.
- Conversion to low pressure systems will probably happen over the next 30 years.

Application of irrigation water when it is of greatest value

- Applying water when and in amounts required will make more efficient use of water.
- Government can provide information on web sites recommending irrigation schedules.
- Farmers can also use meters to monitor their own soil moisture to determine when irrigation is required.

Drip Irrigation

- Drip irrigation technologies apply water directly to the soil as the plant needs it.
- These technologies can be much more efficient than sprinklers, although they are not suitable for the field crops grown in most Saskatchewan irrigated areas.
- Technology would have applications for home garden use and on specialty crops such as raspberries and strawberries.

Community and Domestic

Current use

In Saskatchewan, the community and domestic sector is the second largest user of water after agriculture. Water demand in the mid 1990s was estimated to be 172 million cubic metres, or 20.6 percent of total water use. Of this, approximately 60 percent returns to systems as treated effluent. Saskatchewan average daily per capita consumption was 293 litres per day in 2003, slightly below the national average.

Demand

As cities grow, water demand will also grow unless conservation measures reduce per capita use. Hotter and longer summers resulting from global warming may also increase water consumption for lawn and garden watering.

Conservation Potential

There is a significant potential for conservation in this sector. Residential water use accounts for about 70 percent of all municipal use. Eighty-five percent of residential use is indoor and 15 percent outdoor. Flushing the toilet accounts for 45 percent of indoor residential water use. Bathing accounts for another 30 percent. Technologies, such as ultra-low-flush toilets, low flow showerheads, faucet aerators and front-loading water-efficient washing machines can significantly reduce water use. Conversion from standard toilets at 16 to 22 litres per flush to ultra-low-flush toilets using 6 litres per flush can reduce water use by the toilet from 60 to 75 percent and total interior water use by 30 percent. Adding other conservation techniques and water efficient landscaping will produce further conservation gains. Investment in water conserving appliances or other measures will reduce both water and sewer charges and thus produces a financial return to the homeowner. The payback period will depend both on the amount of water saved and the cost of water, which varies from municipality to municipality.

Residential water use accounts for about 70 percent of all municipal use.

Saskatchewan currently offers rebates for use of energy and water efficient dishwashers and washing machines. This program, though designed for energy conservation, also works to conserve water. Some other provinces have required use of water conserving toilets through their plumbing codes. Many municipalities restrict lawn watering and use education to encourage conservation.

Municipal water distribution systems often lose significant water through leaks. Fixing the systems will conserve water and also reduce any risk of contamination.

Possible actions that will conserve water include:

Home Plumbing and Fixtures

Installation of ultralow-flush toilets, low-flow showerheads and faucet aerators can greatly reduce water use without large investments in time or money. The option exists to retrofit existing fixtures in homes with water saving devices or install water efficient equipment during remodelling or construction.

Revision of The Plumbing and Drainage Regulations

The Plumbing and Drainage Regulations, under the jurisdiction of Saskatchewan Health and administered by the regional health authorities, allow for specifying minimum plumbing requirements for homes and businesses. These regulations could be amended to require water efficient fixtures in new construction.

Domestic Grey Water Recycling

The potential exists to divert some portion of domestic grey water (water from washing machines, showers and other minimally contaminated sources) from the sewage system to be reused for appropriate domestic needs such as watering lawns and gardens. Because these uses do not require the same level of treatment as drinking water, for example, such diversion would reduce the volume of treated water required and would also reduce the volume of sewage to be treated. Certain potential uses for grey water, such as flushing toilets, raise some health concerns and would require further alterations to *The Plumbing and Drainage Regulations*. There would also be a cost to homeowners to retrofit plumbing.

Efficient Appliances

Installation of water efficient appliances such as front-loading washing machines and water efficient dishwashers in homes and businesses are excellent water conservation initiatives.

Government Leadership

Government can show leadership and demonstrate water efficient technology in government buildings.

Water Efficient Landscaping

Approximately 15 percent of residential water use is for outdoor use, mostly to water lawns, trees and gardens. A variety of actions can be taken to conserve water including:

- design of low water demand yards and parks
- use of water efficient drip irrigation systems for gardens, trees and shrubs
- use of water conserving materials which allow better retention and use of water in soil.

Water Utility Pricing Systems

In Saskatchewan many municipalities and water utilities have charged less than the full cost of providing water, which should include depreciation and capital reserve. While this is changing, water prices are generally not designed to encourage conservation, although some water utilities operate to generate a profit that is returned to the municipality. Higher prices encourage conservation by providing faster payback from investments in conservation. Pricing structures, such as an accelerating block structure, recognize that high water users are putting more pressure on water sources and infrastructure than other users and charge higher rates for water above a certain level of use, but are rarely used in Canada.

In Saskatchewan many municipalities and water utilities have charged less than the full cost of providing water.

Metering each user's water use and charging for the actual amount of water used is a proven method of encouraging conservation and is essential to any pricing strategy which seeks to encourage conservation.

Reducing Distribution Losses

About 20 percent of daily municipal water use is attributed to distribution losses and other unaccounted for water use. Leakage is generally the largest component of unaccounted water use. Programs of auditing water use to identify system losses and then locating leaks and reducing these losses can lead to significant conservation gains.

Manufacturing and Processing

Current Use

Manufacturing and processing currently use about 53 million cubic metres of water, which is a little more than six percent of total water use.

Demand

Our expectation is that the demand for water in the industrial and processing area will increase. Agri-value, including agri-food processing, is one of six key sectors actively being pursued for additional economic development within the province. Over the short and long-term, these developments will include meat processing facilities (pork, beef, poultry, bison, and other specialty meats). There will also be additional crop processing facilities built to process pulse crops, mustard, canola, as well as seed cleaning plants.

Saskatchewan also expects growth in food processing that could include flour milling, malt processing, specialty bakery processing, vegetable processing, specialty cheese manufacturing, vegetable oil manufacturing, and specialty and other foods manufacturing. Growth in the slaughter and meat processing areas alone could require an additional 5.6 billion litres (5.6 million cubic metres). Establishment of ethanol plants will also create new water demands.

Because industry pays for water use, conservation can have a direct effect on the bottom line. Industrial water users are becoming more efficient. For the past two decades across Canada, water intake has fallen relative to real manufacturing output. Assuming this trend to greater efficiency continues, we can expect water demand by industry to grow, but probably at a slower rate than production.

Conservation Potential

Because each plant or factory is different, it may be necessary to examine the potential for water conservation on a plant by plant basis. Conservation can be achieved in two ways: by reducing demand and by recycling water. Saskatchewan and Alberta already lead Canada in reuse of water in industry. The Meadow Lake Pulp Mill is an example of an industry with a high reuse water rate.

Saskatchewan currently charges industry for water use, which encourages conservation. The fee structure provides lower fees for low quality water, such as high salinity groundwater, than for high quality fresh water, thus encouraging use of lower quality supplies.

Possible initiatives to encourage water conservation could include:

- Document and share best practices on water efficiency amongst industries.
- Use water audits at individual plants to identify opportunities where water could be used more efficiently.
- Where required, undertake changes to legislation, regulations and policies to encourage and strengthen water conservation and recycling activities.
- Undertake target incentives to encourage and reward water conservation and recycling activities.

Oil, Gas and Mining

Current Use and Demand

The oil and gas industry uses water in several stages of production for a total of about 6.7 million cubic metres.

Fresh water is required for most drilling fluids. This is obtained from lakes, sloughs, dugouts and wells (when surface water is not available). Drilling levels are expected to remain relatively high (approximately 3,500 wells per year) in the short term due to higher prices and decline in the medium term as prices moderate and the basin matures.

The oil industry also uses fresh water for certain enhanced oil recovery projects, including water flood and steam injection projects, in the Kindersley-Lloydminster heavy oil area. Much of this water is sourced from the North Saskatchewan River. While additional steam flood projects are expected in the future, the number of pools well suited to steam flooding is limited.

Mining uses water in several processes including milling. However, the largest water use in the mining sector is for solution mining, especially of potash and sodium sulphate.

Conservation Potential

Saskatchewan also charges the petroleum and mining sectors for water use, which encourages conservation. There is potential to further reduce water use. Potential actions and measures include:

- Work with the industry (particularly major players) to identify and share water conservation success stories and best practices.
- Develop and promote alternative methods of enhanced oil recovery such as solvent extraction (Vapex) and carbon dioxide injection.
- Develop and implement water audit procedures and standards through partnership with the industry sector.
- Where required, undertake changes to legislation, regulations and policies to encourage and strengthen water conservation and recycling activities.
- Undertake target incentives to encourage and reward water conservation and recycling activities.

Thermal Power Generation

Current use

The province's three coal fired thermal power plants produce the majority of the province's electricity. Two of these are located in the Upper Souris River Watershed. The third is located in the Poplar River Watershed. Actual water use from the facilities is 17.1 million cubic metres as a result of evaporation from both the cooling process and evaporation from the reservoir used to store the cooling water. The Shand Plant draws part of its cooling water from Estevan's treated effluent, an example of reuse.

The province's three coal fired thermal power plants produce the majority of the province's electricity.

Demand

Demand for cooling water is steady from year to year and based on actual base power production. This is not expected to increase in the near future and will be dictated by future power demands and the need to increase thermal power generation capability. Any expansion of capacity requires extensive planning with years of lead-time to address all issues before construction can begin. Issues including water use and conservation would normally form part of any required environmental impact statements.

Conservation Potential

Thermal power stations pay the province for cooling water lost through evaporation, providing a financial incentive to conserve. SaskPower has received ISO 14000 designation for its thermal power plants. ISO 14000 is an internationally verified standard relating to environmental monitoring and compliance. Water conservation initiatives are not part of the reporting commitment that SaskPower makes to meet this standard. SaskPower could include water conservation monitoring as part of the ISO 14000 commitment and thus identify and report on what options for conservation are available.

Initiatives Applicable to Multiple Sectors

General

Several possible approaches to water conservation are of broad application and therefore are presented here rather than repeated sector by sector.

Pricing

Water is still widely viewed as a free good, readily and freely available from the environment. In Saskatchewan, industrial users pay a fee for raw water. Other users do not pay for the actual water they use although they do pay costs for distribution and treatment and may pay fees to obtain a water allocation. Government consultations are underway on new regulations that will require municipalities to publicly report on the level of cost recovery of their water supply systems, including infrastructure replacement costs, and what the rates would be if operating at full cost recovery. This will inform consumers of the financial sustainability of their water supply systems and encourage support for cost recovery rates. These measures add to the user pay principles.

Water is still widely viewed as a free good, readily and freely available from the environment.

Our economic system is primarily a market based system and thus responds to cost. Conservation measures, such as more efficient appliances, have a faster payback if water costs more. Individuals and businesses consider cost and payback when making decisions on purchases. Clearly, as water becomes more expensive, a decision to invest in conservation will become not only a good environmental decision, but also a good business decision. However, senior governments regularly provide financial assistance to develop water infrastructure to some sectors, such as irrigation and municipal. Charging these users may be counter productive. In addition, it may be argued that costs such as the energy for pumping already provide a sufficient incentive to conserve water. Further, water is essential for life and costs of water should not impact the ability to obtain minimum domestic needs.

Water Allocation

Most water users in the province must obtain a water allocation from the Saskatchewan Watershed Authority. Although current allocation policies do not specifically mandate conservation, all allocation requests are reviewed and the allocation is based on an assessment of real need. In general, the Authority then allocates water provided a sustainable supply is available.

An option for water conservation is for government to revise its water allocation policies to aid water conservation. Issues that could be addressed in policy might include the following:

- The Authority could be required to consider the benefit to society of proposed water uses when making an allocation decision and decline allocations to some uses.
- Allocations could include a requirement that the user demonstrate effective and efficient use of the water, using currently economical techniques.
- Enforcement and monitoring could be strengthened to ensure water rights are used effectively.

Improved Information

Currently, Saskatchewan does not collect data on all water use. Municipal and industrial withdrawals are usually metered and data on withdrawals by these sectors is relatively good. Data on water use in other areas is much less complete. This not only makes it difficult to track success in water conservation, it also complicates allocation decisions if current use is not known. In addition, knowledge of our water sources is incomplete.

While Saskatchewan has done extensive work to understand groundwater sources, much more work is needed to fully understand this important water supply. Improved data will aid the Saskatchewan Watershed Authority in ensuring water allocations are sustainable. Possible steps to improve data include:

- Metering all major uses to allow tracking and reporting on water conservation.
- Developing adequate data to understand sustainable aquifer yield.
- Develop a model to predict impact of climate change on water supply.

Public Education

Many water conservation initiatives will require significant changes in individual behaviour and individual choices. Some people will need to be persuaded of either the value or the affordability of a variety of conservation measures from shorter showers to low-flow toilets to changes in landscaping. Members of the public must be educated about the need for water conservation and about the practical and meaningful measures that individuals can take to conserve water. Possible public education initiatives could include:

- Enhancing water education in schools through changes in Saskatchewan's Core Curriculum or by strengthening existing water education programs like Project WET (Water Education for Teachers).
- Broader public education initiatives such as advertising and public service announcements.
- Specific publications promoting and explaining water conservation options to reduce domestic use.

Agency Mandates

Several provincial agencies are involved with water management. The principle agencies involved in the *Safe Drinking Water Strategy* are:

Saskatchewan Watershed Authority

The Saskatchewan Watershed Authority focuses on watershed management and source water protection. The Authority balances competing water and land uses that impact water quality and quantity issues.

Saskatchewan Agriculture, Food and Rural Revitalization

Saskatchewan Agriculture, Food and Rural Revitalization's role in water management centres on the relationship between agricultural activities and water resources. This department is responsible for the protection of surface and ground water with respect to intensive livestock operations. The Irrigation Development Branch based in Outlook is responsible for irrigation development, agronomic services, irrigation engineering services and market development services.

Saskatchewan Environment

Saskatchewan Environment is the lead department for the *Safe Drinking Water Strategy*. The department regulates municipal waterworks and privately owned (publicly accessible) waterworks that have a flow rate of 18,000 litres or more per day. It also sets water quality objectives, monitors surface water quality and regulates municipal and industrial discharges.

Saskatchewan Government Relations

Saskatchewan Government Relations manages the Canada-Saskatchewan Infrastructure Program which funds a variety of initiatives including municipal water capital projects. Saskatchewan Government Relations also has legislation regarding municipal protection of water sources through bylaws and regarding pricing and investment policies of municipal waterworks.

Saskatchewan Health

Saskatchewan Health, through the regional health authorities, regulates semi-public waterworks that have a flow of less than 18,000 litres per day. These include on-site water systems serving restaurants, motels, campgrounds, small parks and municipal wells with no distribution system. Saskatchewan Health also provides water analysis through the Provincial Laboratory.

SaskWater

SaskWater owns and operates regional water systems throughout the province providing water to residential and industrial customers. It provides system assessments and project management of water infrastructure projects. SaskWater also provides water and wastewater treatment plant operations on a contractual basis for communities who continue to own their own infrastructure.

Definitions and Conversions

Allocation: The amount or volume of water assigned by the Saskatchewan Watershed Authority to a particular user by issuing a licence or permit.

Diversion: Water that is removed or stored by any type of water facility including pipes, channels or dams.

Potable water: Water that is fit for human consumption and use.

Water conservation: Reducing water use through more efficient water use and the elimination of waste.

Water loss: Water withdrawn from its source and not returned to the surface or ground water environment.

Water use: Water used for a specific purpose, such as domestic use, irrigation or industrial processing.

1 litre = 0.22 imperial gallons
A water efficient toilet uses 6 litres or 1.32 gallons

1 imperial gallon = 4.546 litres

1 cubic metre = a volume of water 1 metre in width by 1 metre in length by 1 metre in height

1 cubic metre = 1000 litres = 220 imperial gallons

1 hectare = 10,000 square metres = 2.47 acres

1 cubic decametre = 1,000 cubic metres = 1,000,000 litres

Conclusion and Request for Comment

Questions

This paper was developed to encourage comment and suggestions from Saskatchewan businesses, associations and citizens on water conservation. Advice would be welcomed. When commenting we would ask you consider these questions as well as providing any additional comments and advice.

1. How important is it for Saskatchewan to initiate water conservation programs at this time?

2. Should targets be set for each sector and what should these targets look like (percent reduction, increased value per unit of water used)?

3. Which are the most appropriate tools for government to use to encourage conservation initiatives: education and extension, incentives, fees, regulations, or a mix?

4. Are there areas of the province, or sectors, where water conservation should be a higher priority than in others?

5. Possible water conservation initiatives have been identified in each sector. Please comment on those potential initiatives in which you have an interest.

   a. *Agriculture*

      i. conversion of flood irrigation and open channel delivery systems
      ii. conversion from high pressure to low pressure sprinkler systems
      iii. improved irrigation scheduling
      iv. drip irrigation

   b. *Community and Domestic*

      i. water-efficient plumbing fixtures and appliances
      ii. revised plumbing regulations
      iii. grey water recycling
      iv. efficient appliances
      v. government leadership
      vi. water-efficient landscaping
      vii. water utility pricing systems and metering
      viii. water audits and leak reduction

c. *Manufacturing and Processing*
   i. information sharing
   ii. water audits
   iii. legislation and regulation
   iv. government incentives

d. *Oil, Gas and Mining*
   i. information sharing
   ii. improved technology for enhanced oil recovery
   iii. water audits
   iv. legislation and regulation
   v. government incentives

e. *Thermal Power Generation*
   i. include water conservation in SaskPower's ISO 14000 compliance system

f. *Multi-Sector*
   i. pricing
   ii. water conservation directly incorporated into allocation policy
   iii. improved collection and reporting of water use data
   iv. enhanced water conservation education

6. Water conservation measures could be advanced in a number of ways:
   - through public education and information
   - through direct and indirect government incentives
   - through a compulsory regulatory approach

   What is the appropriate balance for these approaches?

7. Please identify additional possible strategies to conserve water that you feel should become part of a water conservation program.

Mail your responses to:

Water Conservation Consultation
c/o Saskatchewan Watershed Authority
111 Fairford Street West
Moose Jaw, SK S6H 7X9

Citizens may also respond online at:
www.swa.ca/waterconservation

Notes

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www.swa.ca/waterconservation